

USSR OIL DRILLING IN 1954

[Comment: This report presents information from an article by N. S. Timofeyev entitled "Improve the Qualitative Drilling Indexes Drastically in 1955," which appeared in the Moscow publication Neftyanoye Khozyaystvo, No 1, January 1955.]

Although petroleum output rose in 1954, the over-all meterage planned and actually drilled under the jurisdiction of the ministry in 1954 was somerisen only in the most efficient regions of Glavvostokneftedobycha (Main Administration for Petroleum Production in the Eastern Regions), where it rose 7.5 percent.

By concentrating the drilling work and by stepping up the speed of drilling, the average number of drilling machines operating at the same time in 1954 dropped 12 percent below that of 1953. A further reduction is comtemplated for

Drilling through the hard rock of the eastern regions required much more effort than elsewhere and the higher ratio of these regions to the over-all volume of drilling had an adverse effect on the speed of drilling throughout the entire petroleum industry.

The unexpected bleak climatic conditions in the southern and western regions during the first quarter of 1954 had a considerable adverse effect upon the speed of drilling during the year in those regions. Although the speed of developmental drilling under the ministry rose from 730 meters per machine-month in 1953 to 741 meters in 1954, and that of prospect drilling from 224.9 meters per machine-month to 159.9 meters per machine-month in Azerbaydzhan, from 290.1 to 276.7 meters per machine-month in Groznyy, from 433.5 to 318.2 meters per machine-month in Malgobek, meters per machine-month in Groznyy and from 165.9 to 148.1 meters per machine-month in Kazakhstan.

Unproductive time, that is, idleness and emergency repair work, increased during drilling in 1954. In the first 9 months, the unproductive time rose 6.2 percent from the 31.2 percent earlier and now takes up 37.4 percent of the total time spent in drilling. For every meter drilled, the actual time lost because of unproductivity has risen from .646 to .685 hour. This increase in unproductive time throughout the jurisdiction of the ministry was due to conditions in the southern and western regions.

In the eastern regions, unproductive time dropped from 31.6 to 30.6 percent of the total drilling time, or from 1.02 to .83 hour for every meter drilled. The improvement in these regions (Bashkir ASSR, Tatar ASSR, and Kuybyshevskaya Oblast) was achieved through new equipment, more mechanization, and more forced

The increase in the speed of prospect drilling in the eastern regions in 1954 was also significant. The speed of prospect drilling increased 18 percent, as compared to an increase of 6 percent in developmental drilling. The most striking results were achieved in the Bashkir ASSR and Tatar ASSR. In Bashkiriya, the speed of prospect drilling rose 28.5 percent, while the speed of developmental drilling rose 7 percent. In Tatar, the speed of prospect drilling rose 33 percent while the speed of developmental drilling declined 0.5 percent.



The speed of prospect drilling has been brought closer to that of developmental drilling in both the Glavvostokneftedobycha and in the Tatneft' Association. In Glavvostokneftedobycha, the speed of developmental drilling is 2.25 times that of prospect drilling; it was formerly 2.5 times that of prospect drilling. In the Tatneft' Association, the speed of developmental drilling now is 1.36 times that of prospect drilling, as compared to 1.8 times previously.

The increase in the speed of prospect drilling was achieved despite great difficulty in supplying the prospecting sites with timber and cement, and despite the diversion of transport and manpower to agriculture.

Better and longer use of drilling bits contributed greatly to the rise in the speed of drilling. The supply of bits was adequate in all regions. A number of new bits were tested in 1954, but they were not mass-produced.

The year 1954 also brought out new methods and new potential. For instance, in the summer of 1954 a drilling crew in the Tatar ASSR and another in the Bashir ASSR were able to achieve speeds of 3,000 and more meters per machine-month in Devonian strata. These high speeds were accomplished by using forced drilling methods, without interruption in operations.

Drilling speeds above 1,000 and 1,500 meters per machine-month in Devonian strata have now become general in the Bashkir ASSR and Tatar ASSR. But in the Tatar ASSR the average speeds for developmental drilling do not exceed 565 meters per machine-month. For prospect drilling they do not exceed 404 meters per machine-month in the Bashkir ASSR the average speeds are 849 meters per machine-month for developmental drilling and 383 meters per machine-month for prospect drilling.

Drilling for depth (the actual cutting or boring plus the lowering and pulling operations) was reduced, in the over-all working period balance, from 22.9 to 21.3 percent throughout the industry. In terms of hours per meter drilled, the absolute time spent in drilling was reduced from .5 of an hour to .46 of an hour, that is a drop of 8 percent. This resulted from the introduction of forced methods into turbodrilling.

While the actual boring time was reduced from .265 hour to .226 hour per meter of depth, that is a drop of 17 percent, the time taken up by lowering and pulling operations remained unchanged. The relative proportion of time for the lowering and pulling operations has been constantly increasing, in the over-all time, for several reasons. First, the increase in drilling medium depths; second delay in supplying deep wells, especially those in the southern regions, with modern, high-output winches and, finally, inadequate attention to the mechanization of work of pulling and lowering the pipe in changing bits.

Nothing was done in 1954 to supply the drilling rigs with elevators, wrenches, pneumatic wedges, and automatic lowering and pulling mechanisms, all of which would have speeded up the lowering and pulling operations. The small reduction in time for these operations in the eastern regions, resulting from the introduction of new Y2-4-5 winches, only compensated for the increase in the volume of pulling and lowering pipe plus the increase in the depth of drilling.

The disparity, so far as the productive time balance is concerned, between the technique and organization of work for actual boring, on the one hand, and the carrying out of lowering and pulling operations, on the other hand, becomes more apparent each succeeding year. For instance, in 1950, cutting or boring for depth required 20.5 percent of the productive time, and lowering and pulling operations took 11.4 percent. In 1951, cutting required 18.6 percent and lowering and pulling operations 13.7 percent. In 1952, cutting required 15 percent, while lowering and pulling took up 12.8 percent. In 1953, cutting took up 11.4 percent and lowering and pulling work 13.5 percent.



Not enough attention has been paid either to the technique or organization of lowering and pulling work by the ministry's Administration of Technology, Department of the Chief Mechanic, the Main Administration for the Production of Petroleum Machinery, and the following institutes: Giproneftemash (State Instutite for Designing Petroleum Machinery), Azneftemash (Azerbaydzhan Institute for Petroleum Machinery), and TsIMTneft (Central Institute for Mechanization in the Petroleum Industry.

If the present ratios of the time of cutting and the time required to change a bit are maintained, the possibility of an increase in the trip speed (speed of going up and down) will primarily depend on how much more the bit

Productive estimates for the three drilling intervals (start, intermediate, and deep) under present ratios of drilling time to that needed for lowering and lifting operations, equal in the corresponding depths in the ratio of 1 to 5, 1 to 1, and 1 to 2, provide the following potential for increasing the trip speeds:

The trip speed of an 800-meter deep well can be increased by 1 1/2 times either by cutting 50 percent more with the same bit or by doubling the mechanical speed of drilling. During the interval up to 1,500 meters, the trip speed can be increased either by cutting 50 percent more with the same bit or tripling the mechanical speed. In the deep wells (2,000-2,500 meters) where the ratio between the cutting time and the time for changing the bit is 1 to 2, the trip speed can be increased either by using the same bit drill 50 percent more or by making a great increase in the mechanical speed of drilling.

Higher mechanical speeds in turbodrilling can be achieved by the forced method of drilling without any serious difficulty. The only requirement is to speed up the lowering and pulling operations.

The unusual increase in commercial speeds during prospect drilling in the eastern regions has resulted mainly from the introduction of forced methods into turbodrilling made possible by the supply of Uralmash 5D drilling units. Nearly half of the new U2-4-5 winches, and considerably more than half of the U8-3 pumps and five-diesel drives of the Uralmashzavod (Ural Machine Building Plant) are now working in the eastern regions. The modern Uralmashzavod-made drilling equipment (Uralmash 5D and 3D units) has had a substantial effect upon the increase in mechanical, trip, and commercial speeds. The table (below) provides data on wells completed during 10 months of 1954.

The commercial speed of drilling at installations having five-diesel drives is much higher than that of installations having other types of units; it is 1.97 times higher in the Kuybyshevneft' Association, 1.6 times higher in the Tatneft' Association, and 2.5 times higher in the Euguruslanneft' Trust. By using these machines, the cost per meter of depth becomes reduced so much that the machines almost pay for themselves in the first wells where they are used.

Stand-by, or service, time (vspomogatel'noye vremya) has also risen in the over-all drilling time balance from 22.4 to 23.6 percent, or from .45 to .47 hour per meter of depth. This time could be reduced by not having the drilling crews engage in loading and unloading work connected with the preparation of clay mortar. The service work must be mechanized by supplying each drilling rig with cranes, hydraulic mixers, and different types of small apparatus which would speed up the work.

Much time is lost in preparing the wells for, and carrying out, the electrometric work. Drilling technologists and oil-field geophysicists have not been coordinating their work in this respect and have hardly been making any effort to speed it up.



Repair work time was reduced from 7.3 to 6.7 percent in the over-all work balance, but actually the reduction is clearly inadequate if it is considered that, on the basis of data for drilling wells with the Uralmash 5D units, the repair work time was reduced by 2-2.4 times.

Time-consuming work where conditions are complicated was reduced throughout the ministry from 6.4 to 5.8 percent. But this small drop is only the start toward a greater effort. The time for this type of work was not reduced further because of its increase from 5.6 to 6.8 percent in Glavvostokneftedoby-than, especially in the Bashneft', Kuybyshevneft', and Tatneft' associations. These associations violated instructions for drilling with water. The use of in cave-ins, the tools becoming caught, and an increase in the volume of work to eliminate the cave-ins.

The Ministry of Petroleum Industry was obliged to reduce the nonproductive time 25 percent in 1954 and 50 percent in 1955, but the results for 1954 were very unsatisfactory.

The number of emergencies per 1,000 meters has been reduced constantly as a result of the introduction of turbodrilling on a wide scale, the construction of pipe-repair bases, and some regulations in the dressing of drill pipe. Despite this, the time it takes to eliminate an emergency is not being reduced, either in the balance of time or per meter of depth. In Glavvostokneftedobycha, during the same period the time for liquidating one emergency rose from 185.8 hours to 194.8 hours. This was because the drilling agencies have been paying out tools.

Both the number of emergencies and the time for liquidating them must be reduced in the Ukhta Combine, where 37 percent of all the emergencies in Glav-vostokneftedobycha are found in rotary drilling. The reduction can be accomplished by the introduction of new column bits and turbodrilling in this combine.

Five-diesel drives will have to be employed to ensure the drilling of deep prospect wells at the prospecting sites in Bashkir by the turbine method because of the numerous breakdowns caused by drill pipe during rotary drilling of such wells.

Much still remains to be done in Glavneftegazrazvedka (Main Administration for the Production of Petroleum Gas) to cut down on the number of emergencies and on the time for liquidating them.

To eliminate organizational idleness, the construction of roads, communications facilities, and bases, and the reequipment of prospecting sites will have to be more intensified. As part of the effort, the supplying agencies will have to deliver materials and equipment directly to the drilling projects through the agencies' own warehouses and terminals. Drilling projects will also have to be provided with fast-moving transport, both for hauling freight when roads are not readily available and for the operational needs of the

In order that drilling work may be carried on without interruption, between 800 and 900 million rubles will have to be spent, a fact which cannot be decided in a single year. In line with the intensified construction program contemplated for 1955, adequate supplies of material and fuel will have to be established in the drilling areas.

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This organizational idleness has been due to a number of causes: in some cases, to the looseness and negligence of the drilling foremen; in others, to the necessity of waiting for bits and other tools, even though a supply of equipment and tools might be set up before the job is started.

The measures contemplated to eliminate this organizational idleness are expected to provide the required results in 1955. At the same time, the introduced drilling methods will increase the speed of drilling and reduced drilling costs.

Deserving of some mention is the large-scale use in 1954 of bentonitic powder to make the clay solution. When drilling the intervals requiring a clay solution, a powdered clay, mixed in a cement mixer, was used more and more to make up the clay solution. The use of this clay powder is limited by shortage in output, however. New quarries and grinding mills will have to be built so that production can be expanded in 1955.

The Tatburneft' Trust has been using gypsum-alumina cement to cement-in the conductor-string [apparently the leading pipe] and this has reduced the hardening time considerably. In 1955, the use of this cement will have to be extended to cementing-in developmental casing in the eastern regions, erecting bridges, and the cementing-in of caverns during circulating discharges and losses.

In 1954, the Tatneft' Association introduced, on a wide scale, mechanized bases, where derricks and large block equipment and foundations could be first assembled and then hauled on center-reinforced gun carriages (khrebtovyy lafet) to the drilling sites. This showed how practical it was to move and assemble a heavy-duty drilling unit in 2-3 days, regardless of the design of the machine or its drive. The KhL-1 carriages and the metal design foundations turned out to have some flaws, however, and production of the carriages was held up because Giproneftemash (State Institute for Designing Petroleum Machinery) had delayed in eliminating the shortcomings. This led to some delay in transfering the blocks from finished wells in the Tatar ASSR. This new method for assembling rigs should be adopted on a wide scale in 1955 in the Tatar ASSR, Bashkir ASSR,

In 1954, Glavnefteprommaterialy (Main Administration for the Extraction and Production of Industrial Materials, Ministry of Petroleum Industry USSR) made large deliveries of assembled wooden buildings, garages, repair shops, and warehouses. The manufactured boards are not high-grade, however, and require extra work to eliminate the cracks and other shortcomings in the assembled sectional buildings. Moreover, the agencies which erect the buildings at the drilling and prospecting sites still use antiquated work methods and take 1-3 months instead of 5-6 days to erect a building.

Giprovostokneft' (State Institute for Planning in the Eastern Petroleum Regions) should accelerate its development of work drawings and plans for orthe prospecting regions and then approve the orders of the main administrations for the production of panel boards and other items for these buildings on a large scale, so that the drilling sites in the new prospecting regions could be built up completely in 1955.

VNIIburneft' Institute (All-Union Scientific and Research Institute for Drilling in the Petroleum Industry) in 1954 set up a laboratory to experiment with drilling bits. The research work should enable drillers to get better bits in 1955.

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Effect of Uralmashzavod-Made Equipment on Mechanical, Commercial, and Trip Speeds

			(wells completed first 10 months of 1954)	d first]	lo months of	1954)			
	Ave	Average Mechanical Speed	cal Speed	Ave	Average Commercial Speed	ial Speed	Repair	Time (4 of	Repair Time (4 of over-ell +4)
	Total Units	Uralmash 5D Units	Other Diesel Units	Total	Uralmash 5D Units	Other Diesel Units	Total	Uralmash	Other Diesel
Kuybyshevneft' Association	5.25	5.86	3.64	280.2	334.6	1 021		20 000	
Tatneft'					3	1.011	۳. ٥	5.7	13.6
Association	10.06	12.00	9.05	0.744	550.0	343.0	5.9	0.5	ď
Buguruslanneft' Trust	6	1	Ċ					2	¥.
Molotomost	2	: ;	£.69	194.0	426.0	169.4	9.5	4.8	10.0
Association	1.72	3.01	1.58	251.3	430.6	230.5	8.2	4.35	8.7